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IS 7301 (1974): Grinding Mandrels [PGD 2: Machine Tool Elements and Holding Devices]

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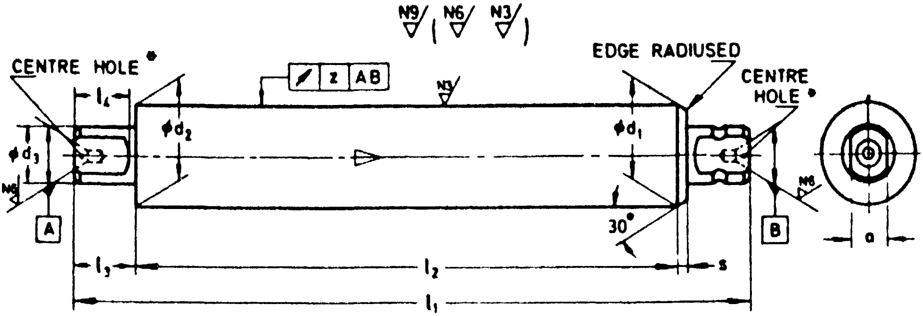
AMENDMENT NO. 1 AUGUST 1980

TO

IS:7301-1974 SPECIFICATION FOR GRINDING MANDRELS

Corrigendum

(*Page 1, clause 2, figure*) – Substitute the following for the existing figure:



(EDC 11)

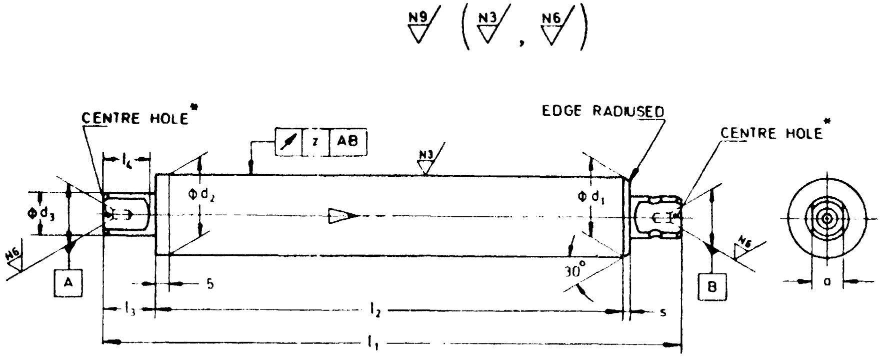
Reprography Unit, BIS, New Delhi, India

AMENDMENT NO. 2 JANUARY 1988

TO

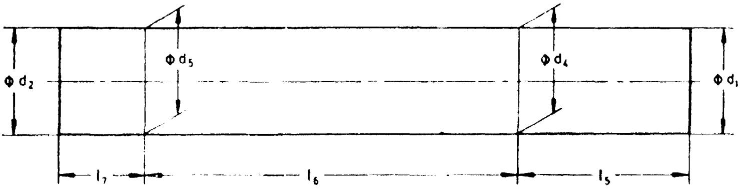
IS : 7301 - 1974 SPECIFICATION FOR GRINDING MANDRELS

(*Page* 1, *clause* 2, *Figure*) — Substitute the following for the existing figure:



(*Page* 2, *Appendix* B, *line* 1) — Substitute 'ISO' *for* 'ISA'.

(*Page* 3, *Appendix* B, *Figure*) — Substitute the following for the existing figure:



(*Page* 3, *Appendix* B, *Table, under column* 'l_5', *last entry*) — Substitute '49' *for* '40'.

(*Page* 3, *Explanatory Note*) — Add the following paragraph at the end:

'While formulating this standard, assistance has been taken from DIN 6374-1980 'Grinding Mandrels' issued by Deutsches Institut für Normung (DIN)'.

(EDC 11)

UDC 621·9-229·324 : 621·924

(Fourth Reprint AUGUST 2001)

IS : 7301 - 1974
(Reaffirmed 1996)

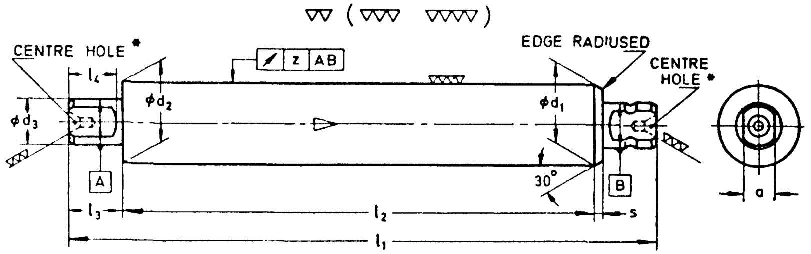
Indian Standard

SPECIFICATION FOR GRINDING MANDRELS

Machine Tools, Machine Tool Elements and Woodworking Machines Sectional Committee, EDC 11; Jigs, Fixtures and Tooling Elements Subcommittee, EDC 11 : 9
[Ref : Doc : EDC 11 (1933)]

1. Scope — Specifies the requirements for grinding mandrels used for holding workpieces having bore diameters within tolerance zone H7 and having bore lengths not greater than those indicated in Appendix A. For this purpose the mandrels are required in pairs, the taper dimensions being so chosen that mandrel No. 1 takes the smaller bores within tolerance zone H7 whilst mandrel No. 2 takes the larger bores within this zone. These mandrels can be repeatedly assembled to the workpiece with coincidence maintained between the mandrel axis and the workpiece axis.

2. Dimensions



*Centre holes up to 6 mm nominal diameter according to Type A of†IS : 2473-1963 ' Dimensions for centre holes and over 6 mm nominal diameter according to Type B of IS : 2473-1963.

†Since revised.

All dimensions in millimetres.

Nominal Diameter d	Mandrel No.	d_1*	d_2*	d_3	l_1	l_2	l_3	l_4	a	s	Diameter Reduction Over 100 (Approx)	z	Permissible Variation on Taper†
Over 3 up to 6	1	$d-0{\cdot}002$	$d+0{\cdot}009$	$d-0{\cdot}5$	71	52·5	9	8	—	0·3	0·021	0·002	0·002
	2	$d+0{\cdot}004$	$d+0{\cdot}015$										
Over 6 up to 10	1	$d-0{\cdot}002$	$d+0{\cdot}012$	5·3	100	79·5	10	9	$4^{+0}_{-0{\cdot}15}$	0·5	0·018	0·002	0·002
	2	$d+0{\cdot}006$	$d+0{\cdot}020$										
Over 10 up to 18	1	$d-0{\cdot}002$	$d+0{\cdot}014$	9	140	115	12	11	$7^{+0}_{-0{\cdot}2}$	1	0·014	0·002	0·002
	2	$d+0{\cdot}007$	$d+0{\cdot}023$										
Over 18 up to 30	1	$d-0{\cdot}002$	$d+0{\cdot}016$	16	220	178	20	18	$12^{+0}_{-0{\cdot}2}$	2	0·010	0·002	0·002
	2	$d+0{\cdot}009$	$d+0{\cdot}027$										
Over 30 up to 50	1	$d-0{\cdot}003$	$d+0{\cdot}019$	25	300	241	28	26	$19^{+0}_{-0{\cdot}25}$	3	0·009	0·002	0·003
	2	$d+0{\cdot}010$	$d+0{\cdot}032$										
Over 50 up to 80	1	$d-0{\cdot}003$	$d+0{\cdot}021$	42	380	303	36	34	$32^{+0}_{-0{\cdot}25}$	5	0·008	0·003	0·003
	2	$d+0{\cdot}012$	$d+0{\cdot}036$										
Over 80 up to 100	1	$d-0{\cdot}004$	$d+0{\cdot}025$	60	450	355	45	42	$46^{+0}_{-0{\cdot}25}$	5	0·008	0·003	0·004
	2	$d+0{\cdot}014$	$d+0{\cdot}043$										

Note — For determination of taper dimensions, *see* Appendix B.

*'d' indicates minimum dimension of the bore for H7 tolerance.

†The permissible variations on taper are referred to length l_2 and only allow taper angle to be larger. The values correspond to IT2 referred to the nominal diameter d.

Adopted 15 March 1974	© September 1974, BIS	Gr 2

BUREAU OF INDIAN STANDARDS
MANAK BHAVAN, 9 BAHADUR SHAH ZAFAR MARG
NEW DELHI 110002

3. Designation

3.1 A set of grinding mandrels (namely, No. 1 and No. 2) for a nominal diameter d = 56 mm shall be designated as:

Grinding Mandrels 56 IS : 7301

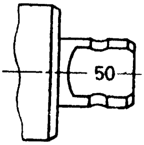
3.2 A single grinding mandrel No. 2 for a nominal diameter d = 56 mm shall be designated as:

Grinding Mandrel 56 No. 2 IS : 7301

4. Material — Case hardening steel having a tensile strength of not less than 800 MN/m² (80 kgf/mm² approx) in the core. For smaller sizes of mandrels up to 15 mm, a suitable direct hardening steel or tool steel may be used.

5. Hardness — 60±2 *HRC*; case depth = 0·6 to 0·8 mm for case hardening steels.

6. Marking — Grinding mandrels shall be marked with the nominal diameter and the manufacturer's name or trade-mark on the flat at the end with smaller diameter. This end shall be provided with a single groove for mandrel No. 1 and two grooves for mandrel No. 2 as shown in the figure given below:



6.1 *Certification Marking* — Details available with the Bureau of Indian Standards.

APPENDIX A

(*Clause* 1)

BORE LENGTH HELD BY FORM FIT

Nominal Diameter *d*, mm	**Up to 24**	**Over 24 Up to 50**	**Over 50 Up to 100**
Maximum bore length	2 *d*	1·5 *d*	1 *d*

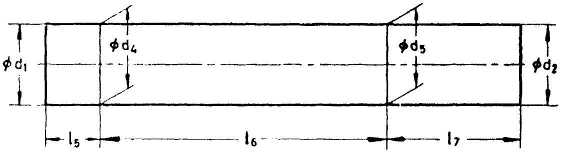
APPENDIX B

(*Note Under Clause* 2)

DETERMINATION OF TAPER DIMENSIONS

The starting values for forming taper diameters d_4 and d_5 are the limits of ISA tolerance zone H7 rounded to even numbers.

From the table given below; the values corresponding to these limits are d_4 on mandrel No. 1 (*Min*) and d_5 on mandrel No. 2 (*Max*). Owing to the fact that the tolerance zone is divided between two mandrels its middle value is fixed at d_5 for mandrel No. 1 and d_4 for mandrel No. 2. Over the length l_7 the mandrel is always oversize and is thus able to provide secure mounting for workpiece bores with lengths according to table given in Appendix A even when the bore is made to maximum dimension for H7.



All dimensions in millimetres.

Nominal Diameter d	d_4		Tolerance on d_4*	d_5		l_5	l_6	l_7
	Mandrel No. 1	Mandrel No. 2		Mandrel No. 1	Mandrel No. 2			
Over 3 up to 6	d	$d+0·006$	$+0·003$	$d+0·006$	$d+0·012$	9·6	28·6	14·3
Over 6 up to 10	d	$d+0·008$	$+0·003$	$d+0·008$	$d+0·016$	11·4	45·4	22·7
Over 10 up to 18	d	$d+0·009$	$+0·003$	$d+0·009$	$d+0·018$	14·4	64·7	35·9
Over 18 up to 30	d	$d+0·011$	$+0·004$	$d+0·011$	$d+0·022$	19·8	108·8	49·4
Over 30 up to 50	d	$d+0·013$	$+0·004$	$d+0·013$	$d+0·026$	32·9	142·4	65·7
Over 50 up to 80	d	$d+0·015$	$+0·005$	$d+0·015$	$d+0·030$	37·9	189·4	75·7
Over 80 up to 100	d	$d+0·018$	$+0·006$	$d+0·018$	$d+0·036$	40	220·3	85·7

*Corresponds to IT3.

EXPLANATORY NOTE

The grinding mandrels have been given taper angles for allowing workpieces with a parallel bore to be held with a form fit. Owing to the small taper angle the tolerance zone H7 has been divided in each diameter range between two mandrels so that it extends in each case over length l_6 between d_4 and d_5 (the tolerance zone H6 and G6 are included in H7). Workpiece lengths for this purpose are taken as approximately $2d$ over the range from 3 to 6 mm and approximately equal to d over the range from 80 to 100 mm. Intermediate lengths are graduated accordingly. The dimensions l_7 at the thick end of the mandrel allows these workpiece lengths to be pressed in the case of bore lying at or near the maximum. For true mounting it is important that the mandrels shall be pressed in truly vertically.

For reasons of convenience in measurement, it has been decided to define dimensions d_1 and d_2 for measurement purposes. They have therefore been adopted as whole μm values. In connection with the length l_2, diamerer reductions occur on the taper and these are listed in the table as rounded off values. The length l_1 has been brought into line with preferred sizes according to IS : 1076-1967, ‘Preferred numbers (*first revision*)’. To enable the work to be driven by methods other than the usual grinding carrier, two flats are provided; mandrels with nominal diameter under 6 mm do not have any flats.

The tolerances provided for diameter d_4, the runout and the taper adopted represent the limit for economic manufacture. To meet the tolerance zone H7, it is necessary for dimensions d_4 to be given an allowance (*see* table in Appendix B). Similarly the taper angle is allowed large only. The same basis can be followed for other tolerances also.